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MAMMALS FROM THE MEXICAN STATE OF SINALOA. II. CHIROPTERA

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The Mexican state of Sinaloa is strategically located in the transition zone between the temperate and tropical regions of North America. The zoogeographic significance of this part of western México is particularly evidenced by distributional patterns of bats (Koopman, 1961), but no attempt has been made previously to document the occurrence and distribution of Sinaloan Chiroptera on a state-wide basis. In the period 1950 to 1968, field parties and representatives from the Museum of Natural History at The University of Kansas collected mammals in Sinaloa, and this report is based on specimens thus obtained, some material in other museums, and a perusal of the pertinent literature.

To date, 44 species of bats have been taken in Sinaloa. Two additional species, *Eumops underwoodi* and *Tadarida aurispinosa*, are known in western México from both north and south of the state, and likely will be found there. Furthermore, certain other Neotropical species, such as *Myotis nigricans* and *Micronycteris sylvestris*, have been recorded from as far north as central Nayarit, and may occur in suitable habitats in southern Sinaloa.

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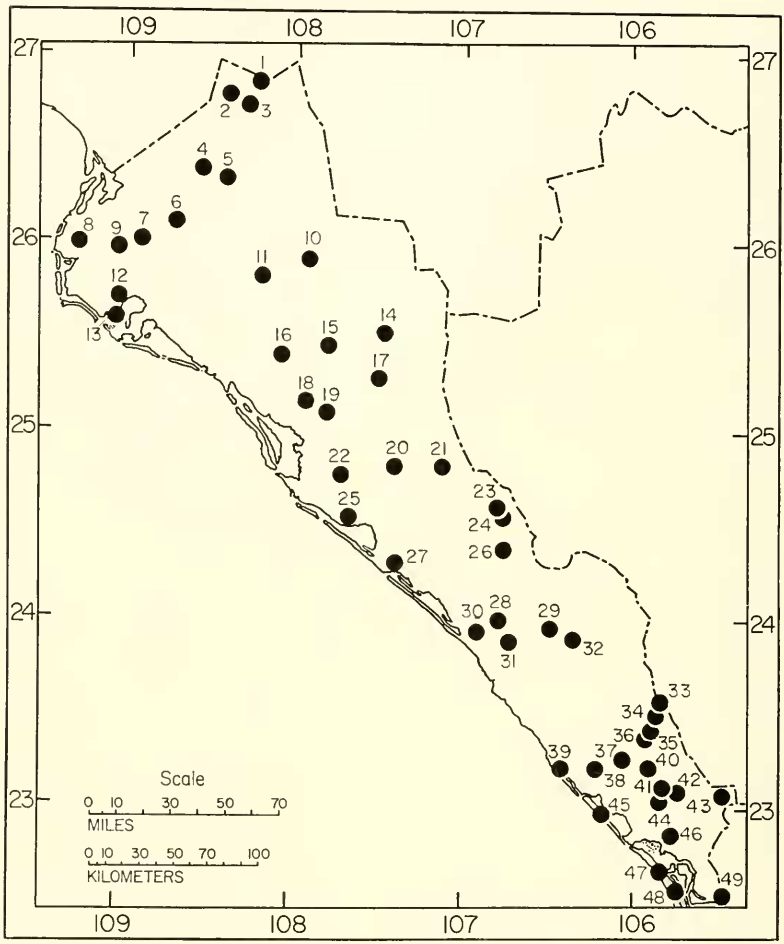

Fig. 1.—Map of Sinaloa showing location of place-names used in this report. From north to south, these are: 1, El Cajón; 2, Vaca; 3, Choix; 4, El Fuerte; 5, Chinobampo; 6, San Blas; 7, El Carrizo; 8, Zaragosa; 9, San Miguel; 10, Bacubirito; 11, Sinaloa; 12, Los Mochis; 13, Topolobampo; 14, Alisos; 15, San Benito; 16, Guamúchil; 17, Badiraguato; 18, Terrero; 19, Pericos; 20, Culiacán; 21, Presa Sanalona; 22, Navolato; 23, Aguacaliente; 24, Casa Blanca; 25, El Molino; 26, Cosalá; 27, El Dorado; 28, Elota; 29, San Ignacio; 30, La Cruz; 31, Camino Real and Piaxtla (one symbol); 32, San Juan; 33, Palmito (Palmarito); 34, Santa Lucía; 35, Pánuco; 36, Copala; 37, Concordia; 38, Villa Unión (including Presidio); 39, Mazatlán; 40, Chele; 41, Cacalotán; 42, Matatán; 43, Plomosas; 44, Rosario; 45, Isla Palmito de la Virgen; 46, Escuinapa; 47, Palmito, Isla Palmito del Verde; 48, Teacapán, Isla Palmito del Verde; 49, Concepción.

This is the second in a series of publications intended eventually to encompass the entire mammalian fauna of Sinaloa. A useful summary of the environment of the state was provided by Hardy and McDiarmid (1969) in their report on the herpetofauna. Additional commentary as relates to mammals has been published by Armstrong and Jones (1971), Birney and Jones (1971), Dunnigan (1967), and Koopman (1961). An analysis of zoogeographic relationships of the mammalian fauna of Sinaloa will appear later.

Measurements and weights, given where appropriate in the following accounts, are in millimeters and grams, respectively. The arrangement of localities in lists of specimens examined and additional records is from north to south. Location of place-names mentioned in text is shown on Fig. 1. Gordon B. Corbet and J. E. Hill of the British Museum (Natural History), A. M. Husson of the Rijksmuseum van Natuurlijke Historie in Leiden, and Robert J. Baker of Texas Tech University allowed us to study Sinaloan bats in their charge. The majority of the specimens examined (those without institutional designation) are in the collection of The University of Kansas Museum of Natural History. We are grateful to the many persons from the Museum who participated in field studies in Sinaloa, particularly J. R. Alcorn, P. L. Clifton, and M. R. Lee, under permits granted by the Dirección General de la Fauna Silvestre de México. Field work was supported principally by the Kansas University Endowment Association and a contract (DA-49-193-MD-2215) with the U.S. Army Medical Research and Development Command. We are indebted also to Hugh H. Genoways and R. Laurie Hendricksen for their considerable aid in readying this report for publication.

ACCOUNTS OF SPECIES

Family Emballonuridae

Balantiopteryx plicata plicata Peters, 1867

Specimens examined (162).—10 km S, 38 km E Sinaloa, 800 ft, 2; 20 km N, 5 km E Badiraguato, 1800 ft, 14; 1.5 mi N Badiraguato, 750 ft, 3; 17 mi SSE Guamúchil, 1; 4 mi N Terrero, 2; 1 mi S Pericos, 3; 2 mi E Aguacaliente, 800 ft, 10; 32 mi SSE Culiacán, 1; San Ignacio, 700 ft, 7; 0.5 mi E Piaxtla, 1; Santa Lucía, 3600 ft, 8; 2.5 km E Santa Lucía, 3200 ft, 31; Pánuco, 2050 ft, 13; 2.5 mi NE Concordia, 3; 5 mi NW Mazatlán, 29; Mazatlán, 2 (Leiden Mus.); 1 mi SE Mazatlán, 10 ft, 16; Isla Palmito de la Virgen, 15 ft, 2; 0.5 mi W Rosario, 100 ft, 3; 5 mi SSE Rosario, 2; Tatemales, near Rosario, 6 (BM); 10 mi SE Escuinapa, 1; N end Isla Palmito del Verde, 10 ft, 2.

Additional records (Villa-R., 1967:152, unless otherwise noted).—[Cueva de] la Chinacatera, Monte Largo, 23 km W Pericos; Mazatlán (Sanborn, 1937: 352); "cerro El Faro, Mazatlán"; "Cueva de Don Cristino," [*ca.*] 20 km E Mazatlán; "34 mi (54.4 km) [direction not given] Mazatlán"; Rosario (Koopman, 1961:536); Escuinapa (J. A. Allen, 1906:235).

TABLE 1.—Selected measurements of two subspecies of *Balantiopteryx plicata* from Sinaloa.
Superscript numbers indicate fewer specimens averaged than listed in left-hand margin.

Number averaged and sex	Length of forearm	Greatest length of skull	Zygomatic breadth	Postorbital constriction	Breadth of braincase	Mastoid breadth	Length of maxillary toothrow
Balantiopteryx plicata plicata, 5 mi NW Mazatlán							
Average (10 ♂)	41.0	14.1[3]	9.1[9]	3.4	7.2	8.4	5.4
Minimum	40.0	13.8	9.0	3.3	7.0	8.1	5.3
Maximum	42.1	14.4	9.3	3.5	7.3	8.6	5.5
Average (12 ♀)	42.2	14.5[4]	9.2	3.3	7.0	8.3	5.4
Minimum	41.0	14.2	8.8	3.1	6.7	8.0	5.3
Maximum	43.5	14.8	9.4	3.5	7.2	8.6	5.6
Balantiopteryx plicata pallida, 10 mi NNW Los Mochis							
Average (7 ♂)	39.6	13.4	8.5	3.3	6.8	7.8	5.1
Minimum	38.0	13.0	8.3	3.0	6.5	7.5	5.0
Maximum	40.4	13.8	8.7	3.5	7.0	8.0	5.4
Average (10 ♀)	41.0	13.7	8.6	3.1	6.8	7.8	5.2
Minimum	39.4	13.4	8.5	2.9	6.5	7.6	5.0
Maximum	42.5	13.8	8.9	3.4	7.0	8.0	5.3

Specimens herein assigned to the subspecies *B. p. plicata* average significantly larger (Table 1) and have darker (usually brownish rather than gray) and more luxuriant pelage than do specimens assigned to *B. p. pallida*. Bats labeled with reference to Santa Lucía and Culiacán resemble those from the vicinity of Mazatlán but have paler pelage. Specimens from 4 mi N Terrero, 1 mi S Pericos, and 17 mi SSE Guamúchil are intergrades (slightly nearer *plicata* in size) between the two subspecies. Those listed with reference to Sinaloa and Badiraguato also are intergrades; their pelage is paler than that of most other *plicata*, but they are provisionally referred to that subspecies because they most closely approach typical specimens in cranial features.

The series from 5 mi NW Mazatlán was collected in an old mine in the side of a cliff facing the sea. Some of the specimens from near Santa Lucía also were taken in a mine. Most other specimens in our collection were shot or netted. Ten males and 12 females from the vicinity of Mazatlán had an average weight of 5.2 (5.0-6.0) and 5.6 (4.5-6.5) gms, respectively.

Six females taken in June carried embryos (crown-rump length 12 to 16 mm), as did three obtained in July (crown-rump length 21 to 23 mm).

Balantiopteryx plicata pallida Burt, 1948

Specimens examined (48).—0.5 mi SE Vaca, 650 ft, 2; 2 mi N San Blas, 50 ft, 4; 3 mi NE San Miguel, 300 ft, 5; 10 mi NNW Los Mochis, 32; 1.5 mi NW Topolobampo, 10 ft, 5.

The pelage of the specimens from 1.5 mi NW Topolobampo is as darkly pigmented as that of individuals of the subspecies *plicata* from southern Sinaloa, but cranial dimensions clearly show their affinities to be with the subspecies *pallida*.

Some specimens from 10 mi NNW Los Mochis were collected in shallow caves, whereas those from 1.5 mi NW Topolobampo were removed from cracks in the ceiling of a rocky hollow near the coast. Other bats in our collection were shot as they foraged. Eight females collected in early June were pregnant, containing embryos having crown-rump lengths of 11-15 mm.

Family Noctilionidae

Noctilio leporinus mexicanus Goldman, 1915

Specimens examined (13).—San Benito, 400 ft, 1; 1.5 mi N Badiraguato, 750 ft, 1; Isla Palmito de la Virgen, 15 ft, 11.

Additional record.—Chele, 400 ft (Koopman, 1961:536).

Specimens of the big fish-eating bat from Isla Palmito de la Virgen were caught in a mist net over a small, freshwater pond where terns had been observed feeding during the day. The one specimen from San Benito, which constitutes the northernmost record of the species, was netted over the middle of a wide (30 feet) but shallow part of the Río Mocorito, and the one from north of Badiraguato also was netted over a stream.

Three of seven females taken in mid-June were lactating, and three males had testes ranging in length from 5 to 10 mm.

Family Chilonycteridae

Pteronotus parnellii mexicanus (Miller, 1902)

Specimens examined (111).—12 mi NE San Benito, 1000 ft, 1; 20 km N, 5 km E Bardiraguato, 1800 ft, 1; 7 mi ENE Presa Sanalona, 600 ft, 1; 4 mi S Casa Blanca, 1200 ft, 1; 3 mi SE Camino Real, 500 ft, 35; 1 mi E Santa Lucía, 3650 ft, 2; 1.5 km S Santa Lucía, 3200 ft, 14; Pánuco, 2050 ft, 44; 1.5 km W Copala, 1400 ft, 4; 2.5 mi NE Concordia, 1; 12 km N Villa Unión, 400 ft, 3; 5 mi WSW Plomosas, 800 ft, 3; 0.5 mi S Concepción, 250 ft, 1.

Additional records.—Monte Largo, *ca.* 14 mi W Pericos (Constantine, 1959: 442—also reported as Cueva de la Chinacatera, 60 km NW Culiacán by Villa-R., 1967:176); Río Piaxtla (on Mexican Highway 15 at Camino Real) (Baker, 1967:426); Hda. Chele, 300 ft, 15 mi N Rosario (Hooper, 1955:8).

Parnell's mustached bat occurs throughout the length of Sinaloa at low to moderate elevations. Most of our specimens were obtained in or near caves or mines; an estimated 800 were discovered

in an old gold mine 3 mi SE Camino Real, where they were associated with *Glossophaga soricina leachii, Macrotus waterhousii bulleri,* and *Desmodus rotundus murinus.*

One female taken in May carried an embryo that was 17 mm in crown-rump length, one captured in June was pregnant (embryo 30 mm), and another obtained at the same time had recently given birth and was lactating. Three females taken in July evidenced lactation.

Pteronotus psilotis (Dobson, 1878)

Specimens examined (19).—0.5 mi SE Vaca, 650 ft, 2; 1 mi S, 6 mi E El Carrizo, 3; La Cruz, 30 ft, 1; 1.5 mi N Badiraguato, 750 ft, 6; 1 mi W Matatán, 2; Isla Palmito de la Virgen, 15 ft, 1; 0.5 mi S Concepción, 250 ft, 4.

Additional record.—Cueva de la Chinacatera, 23 km W Pericos (Baker and Christianson, 1966:311).

Our specimens were netted or shot as they flew over water courses, mostly in otherwise relatively xeric habitats. A female caught in June on Isla Palmito de la Virgen contained an embryo that had a crown-rump length of 17 mm.

Pteronotus davyi fulvus (Thomas, 1892)

Specimens examined (47).—1 mi E Sinaloa, 180 ft, 1; 1 mi S, 6 mi E El Carrizo, 5; San Juan, 8 mi SE San Ignacio, 1; 1 mi E Santa Lucía, 3650 ft, 1; Pánuco, 2050 ft, 36; 3 mi SE Plomosas, 4000 ft, 1; 5 mi WSW Plomosas, 800 ft, 2.

Additional records.—[Cueva de] la Chinacatera, Monte Largo, 23 km W Pericos (Villa-R., 1967:181); Escuinapa (J. A. Allen, 1906:236).

Specimens of Davy's naked-backed bat were collected at Pánuco by natives, who found them in small mines. The remainder of our series was netted or shot near ponds or rivers. One female obtained 1 mi E Santa Lucía on 22 June 1955 carried an embryo 21 mm in crown-rump length.

Mormoops megalophylla megalophylla Peters, 1864

Specimens examined (39).—1 mi E Santa Lucía, 3650 ft, 1; 1.5 km S Santa Lucía, 3200 ft, 6; Pánuco, 29; 3 mi SE Plomosas, 4000 ft, 2; 0.5 mi W Rosario, 100 ft, 1.

Additional record.—Rosario (Davis and Carter, 1962a:66).

Most of our specimens of *Mormoops* were collected in mines where they usually clustered as far as possible from the entrance. At both Pánuco and Santa Lucía, this bat was taken in mines containing standing water. Other specimens listed herein were netted. The species no doubt is widely distributed in suitable habitats in Sinaloa, even though all of our records are from the southern part of the state.

Davis and Carter (1962a:66) assigned Sinaloan representatives of *M. megalophylla* to the subspecies *M. m. rufescens*. However, pending publication of a revision of the genus by J. D. Smith, we follow Villa-R. (1967:187-189) in recognizing only one subspecies in México.

Family Phyllostomatidae

Macrotus waterhousii bulleri H. Allen, 1890

Specimens examined (50).—3 mi SE Camino Real, 500 ft, 1; 6 mi W Santa Lucía, 3650 ft, 1; Santa Lucía, 3600 ft, 4; 1 km NE Pánuco, 2700 ft, 13; Pánuco, 2050 ft, 31.

Additional record.—Copala (Anderson and Nelson, 1965:31).

The subspecies *bulleri* reaches the northern limit of its distribution in Sinaloa. Intergradation between *bulleri* and the more northerly subspecies *californicus* no doubt will be demonstrated in north-central Sinaloa when material is available from that area. Most of our specimens of this species were collected in caves or abandoned mines, but a few were netted over streams, ponds, or roads, or brought in by natives. Lactating females and young of the year were taken in July.

Macrotus waterhousii californicus Baird, 1859

Specimens examined (36).—13 km NNE Vaca, 1300 ft, 1; 1 mi S, 6 mi E El Carrizo, 1; 12 mi N, 3 mi W Los Mochis, 34.

This subspecies is known in Sinaloa only from the northern part of the state, south to the drainage basin of the Río del Fuerte. *Macrotus w. californicus* differs from *M. w. bulleri* of the southern part of Sinaloa principally in having larger ears and bullae, a narrower interorbital region, and paler coloration (Anderson and Nelson, 1965).

Glossophaga commissarisi Gardner, 1962

Specimens examined (9).—20 km N, 5 km E Badiraguato, 1800 ft, 4; Santa Lucía, 3600 ft, 5.

Our Sinaloan specimens of this long-tongued bat, all females, represent the northernmost known locality for the species; the previous northernmost records are from southern Durango (Baker and Greer, 1962:67) and central Nayarit (Villa-R., 1964:388). The series from Santa Lucía was obtained by natives in a cave; bats from northeast of Badiraguato were netted over a large stream. Each of four females taken on 27 January was gravid with a single embryo (6.5-10 mm in crown-rump length), whereas only one of five taken at Santa Lucía on 14 July was pregnant (embryo 8 mm in length).

Glossophaga commissarisi markedly resembles its congener *G. soricina* in size and other external features, and the two frequently

TABLE 2.—Selected measurements of two species of *Glossophaga* from Sinaloa.

Number averaged, or catalogue number, and sex	Length of forearm	Greatest length of skull	Zygomatic breadth	Breadth of braincase	Mastoid breadth	Length of maxillary toothrow
Glossophaga commissarisi						
KU 94744, ♀	34.9	20.5	9.6	8.7	9.2	7.0
KU 96461, ♀	35.7	21.2	9.7	8.8	9.5	7.3
KU 96463, ♀	35.4	21.0	9.4	8.7	9.3	7.4
Glossophaga soricina leachii						
Average, 10 (1♀, 9♂)	35.1	21.4	9.5	8.7	9.2	7.4
Minimum	34.0	20.7	9.0	8.5	8.9	7.0
Maximum	36.2	22.0	10.0	8.9	9.4	7.7

are difficult to distinguish in the field. A number of subtle cranial characters serve to distinguish the two, however; the most trenchant are: first upper incisors less procumbent in *commissarisi* and the two pairs nearly the same size (inner pair noticeably larger than outer teeth in *soricina*); premaxillary more or less evenly rounded anteriorly in *commissarisi*, not attenuate; lower incisors usually small and peglike in *commissarisi*, with evident space between middle pair and frequently between all teeth (usually robust and filling the gap between the canines in *soricina*); presphenoid ridge flattened subterminally in *commissarisi*. Comparative measurements of Sinaloan specimens of the two species are given in table 2.

Glossophaga soricina leachii (Gray, 1844)

Specimens examined (299).—18 km NNE Choix, 1; 16 mi NNE Choix, 1700 ft, 16; 0.5 mi E El Cajón, 1800 ft, 4; 0.5 mi SE Vaca, 650 ft, 2; 6 km E El Fuerte, 400 ft, 2; 6 km SW San Blas, 30 ft, 2; 1.5 mi N Badiraguato, 750 ft, 3; Cosalá, 1300 ft, 1; 6 km E Cosalá, 1500 ft, 3; El Dorado, 13; 1 mi S El Dorado, 1; La Cruz, 30 ft, 8; San Ignacio, 700 ft, 5; San Juan, 2; Piaxtla, 100 ft, 1; 3 mi SE Camino Real, 500 ft, 93; 6 mi W Santa Lucía, 3650 ft, 1; Santa Lucía, 3600 ft, 31; 2.5 km E Santa Lucía, 3200 ft, 3; 1 km NE Pánuco, 2700 ft, 2; Pánuco, 2050 ft, 23; 1.5 km W Copala, 1400 ft, 9; Copala, 1; 12 km N Villa Unión, 400 ft, 4; 8 km N Villa Unión, 450 ft, 6; 5 mi NW Mazatlán, 1; 1 mi SE Mazatlán, 10 ft, 1; Matatán, 550 ft, 5; Plomosas, 2500 ft, 19; 5 mi WSW Plomosas, 800 ft, 7; 4 mi N Rosario, 9; 0.5 mi W Rosario, 15; N end Isla Palmito del Verde, 5.

Additional records.—El Molino (Koopman, 1961:536); Río Piaxtla (on Mexican Highway 15 at Camino Real) (Baker, 1967:427); 8 mi (by road) N Mazatlán (Ingles, 1959:382); 3-4 mi N Mazatlán (Villa-R., 1967:231); Rosario (Koopman, 1961:536); 8 mi SE Rosario (Koopman, 1961:536); Escuinapa (J. A. Allen, 1906:236).

Pallas' long-tongued bat is one of the commonest and most widespread Neotropical species in Sinaloa, occurring the length of the state at low and moderate elevations. From at least the

vicinity of El Molino and El Dorado southward, *G. soricina* occupies suitable habitat from sea level to about 3600 feet along streams on the Pacific slope of the Sierra Madre Occidental. Farther north, the species seemingly avoids arid coastal areas, but is known from a number of localities along the Río del Fuerte and its tributaries above San Blas.

Many of our specimens were trapped or shot in mines and caves; others were taken in mist nets in a variety of situations, mostly over water. Gravid females have been taken in the months of March, May, and August through January.

Anoura geoffroyi lasiopyga (Peters, 1868)

Specimens examined (16).—12 mi NE San Benito, 1000 ft, 1; 1 km NE Santa Lucía, 3700 ft, 1; Santa Lucía, 3600 ft, 12; 1.5 km S Santa Lucía, 3200 ft, 1; Matatán, 550 ft, 1.

This species first was reported from Sinaloa by Jones (1964:510). The bat from 12 mi NE San Benito represents the northernmost record in western México. Most of our specimens were captured in mist nets set in mango or banana groves; one was netted over a small stream, and another (from Matatán) was taken in a mine tunnel.

None of six females taken in July was reproductively active. Testes of a male captured on 25 June were 1.5 mm in length, whereas those of two taken in mid-July each measured 6 mm.

Choeronycteris mexicana Tschudi, 1844

Specimens examined (14).—18 km NNE Choix, 1; 16 km NNE Choix, 1700 ft, 2; 1 mi S El Cajón, 1800 ft, 1; 12 mi N, 4 mi W Los Mochis, 2; 10 km S, 38 km E Sinaloa, 800 ft, 3; 20 km N, 5 km E Badiraguato, 1800 ft, 2; La Cruz, 30 ft, 1; Pánuco, 2050 ft, 2.

Additional record.—6 mi E Santa Lucía (Schaldach and McLaughlin, 1960:8).

This long-tongued species is widely distributed at low to moderate elevations throughout western Sinaloa but evidently is nowhere especially common. All bats at hand are from elevations of 1800 feet or less, and *C. mexicana* may not occur regularly at higher elevations in the eastern part of the state. The specimen reported by Schaldach and McLaughlin (1960:8), however, probably is from an area above 3000 feet in elevation, suggesting that some individuals occur in major river valleys to the border of Durango and beyond.

Many of our specimens were obtained in caves, but others were netted over streams, arroyos, or roads. The only pregnant female was taken 1 mi S El Cajón on 11 February 1965 (embryo 14 mm in crown-rump length).

Choeroniscus godmani (Thomas, 1903)

The one specimen, a pregnant female from San Ignacio, 700 feet, reported by Jones (1964:510), remains the only Sinaloan record of this relatively rare glossophagine. It was captured by P. L. Clifton on the night of 18-19 July 1962 in a mist net over a small, fig-lined creek.

Leptonycteris nivalis (Saussure, 1860)

This long-nosed bat is known from Sinaloa only by two females collected "in the pine-oak zone" 10.3 mi (by road) W Palmito [Palmarito], 6000 feet, on 18 February 1964 (Baker and Cockrum, 1966:330). Means by which *L. nivalis* can be distinguished from the commoner and more widely distributed (in western México) *L. sanborni* have been enumerated by Davis and Carter (1962b: 194-197), Phillips *et al.* (1969:1368-1369), and Jones and Genoways (1970:14-15).

Leptonycteris sanborni Hoffmeister, 1957

Specimens examined (42).—6 km SW San Blas, 30 ft, 3; 1 mi N, 0.5 mi E San Miguel, 1; 1.5 mi N Badiraguato, 750 ft, 1; El Dorado, 8; 2 mi E Aguacaliente, 800 ft, 1; La Cruz, 30 ft, 3; San Ignacio, 700 ft, 1; Pánuco, 2050 ft, 19; 8 km N Villa Unión, 450 ft, 1; Matatán, 550 ft, 4.

Additional records.—Elota (Baker and Cockrum, 1966:329); Escuinapa (Hoffmeister, 1957:457).

Leptonycteris sanborni occurs at low to moderate elevations throughout Sinaloa. Pánuco, at 2050 feet, is the highest altitude in the state from which specimens thus far have been reported. Baker and Cockrum (1966:330), who recorded the only known representatives of *Leptonycteris nivalis* from Sinaloa, believed *sanborni* and *nivalis* to be "ecologically isolated," with the latter occurring at higher elevations than the former. Many of our specimens of *sanborni* were taken in mist nets set over streams or in banana or mango groves. Some were captured in abandoned mines, and one from 8 km N Villa Unión was taken in a road culvert.

The only pregnant females in our material are one taken near Aguacaliente on 21 February (crown-rump length of embryo 17 mm), one from La Cruz in early July (embryo 17 mm), and a third from El Dorado on 13 November (embryo 20 mm). Adult males had testes 2 mm in length in October (two) and November (one), and 4 mm in June (three).

Sturnira lilium parvidens Goldman, 1917

Specimens examined (60).—1 mi S El Cajón, 1800 ft, 1; 13 km NNE Vaca, 1300 ft, 2; 6 km SW San Blas, 30 ft, 5; 12 mi NE San Benito, 1000 ft, 4; 20 km N, 5 km E Badiraguato, 1800 ft, 15; 7 mi ENE Presa Sanalona, 600 ft, 4; 2 km E Aguacaliente, 800 ft, 1; 32 mi SSE Culiacán, 1; 1 mi S El Dorado, 1; La Cruz, 30 ft, 4; San Ignacio, 700 ft, 3; 1 mi E Santa

Lucía, 3650 ft, 10; Pánuco, 2050 ft, 4; 12 km N Villa Unión, 400 ft, 1; Plomosas, 2500 ft, 1; 5 mi WSW Plomosas, 800 ft, 3.

Additional record.—Elota (Cockrum and Bradshaw, 1963:6).

Most Sinaloan specimens of this species were captured in mist nets set over creeks or arroyos. *Sturnira lilium* occupies low tropical habitats in the state where fruits are available throughout the year. At elevations above 2000 feet, this species occurs primarily in the vicinity of water courses and the tropical deciduous forest associated with them; 3650 feet is the highest elevation from which *S. lilium* is known in the state.

Pregnant females were taken in May (embryo 28 mm in crown-rump length), June (embryo 8 mm), and August (two, embryos 25 and 27 mm). Two bats netted in June were noted as lactating by the collector, and one taken in November had enlarged mammae, indicating past or present lactation.

Sturnira ludovici occidentalis Jones and Phillips, 1964

Specimens examined (6).—5 km SW Palmito [Palmarito], 6100 ft, 2; Santa Lucía, 3600 ft, 3; Plomosas, 2500 ft, 1 (the holotype).

Sinaloan specimens of this species were caught in nets set near orchards around which the dominant vegetation consisted of oak or pine. Although *S. ludovici* has been taken sympatrically with *S. lilium* at one locality (the type locality of *occidentalis*—see Jones and Phillips, 1964:478, 480) in Sinaloa, the two species generally seem to be separated ecologically; *S. ludovici* dwells near sources of fruit at elevations where oak and even pine predominate, whereas *S. lilium* prefers tropical lowlands.

Selected measurements of the holotype, a female, followed by those of two males from Santa Lucía and one from 5 km SW Palmito, respectively, are: length of forearm, 42.5, 42.3, 43.5, 44.4 mm; greatest length of skull, 22.0, 22.7, 23.1, 23.5 mm; zygomatic breadth, 12.5, 13.1, 13.4, 13.5 mm; mastoid breadth, 11.4, 11.5, 11.9, 11.8 mm; postorbital constriction, 5.3, 5.8, 5.8, 6.0 mm; length of maxillary toothrow, 6.1, 6.3, 6.5, 6.5 mm. The three males weighed 19.6, 22.4, and 22.0 gms, respectively. The specimen listed last, taken on 17 July, had testes 4.5 mm long.

Artibeus aztecus aztecus Andersen, 1906

Specimens examined (45).—5 km SW Palmito [Palmarito], 6100 ft, 2; Santa Lucía, 3600 ft, 34; 2.5 km E Santa Lucía, 3200 ft, 9.

Additional records.—Rancho Batel, 5 mi NE Santa Lucía, 5200 ft (Koopman, 1961:536); near Santa Lucía (Davis, 1969:22).

The Aztec fruit-eating bat, first reported from Sinaloa by Koopman (1961:536), is known from several localities at relatively high

TABLE 3.—Comparative measurements of selected adult specimens of six species of *Artibeus* from Sinaloa.

Weights do not include those of pregnant females. Superscript numbers indicate fewer specimens averaged than listed in the left-hand margin.

Number averaged and sex	Length of forearm	Greatest length of skull	Zygomatic breadth	Mastoid breadth	Postorbital constriction	Length of maxillary toothrow	Weight in grams
			Artibeus aztecus aztecus				
Average (10♂, 5♀)	44.1	21.9	12.8	11.4	5.6	7.0	21.4
Minimum	43.2	21.4	12.4	10.8	5.3	6.7	17.8
Maximum	45.8	22.4	13.2	12.1	6.2	7.3	26.0
			Artibeus hirsutus				
Average (5♂, 5♀)	54.3	26.7[8]	16.3	13.9[8]	6.7	9.7	33.3
Minimum	53.2	26.2	16.0	13.5	6.5	9.5	28.4
Maximum	55.5	27.0	16.8	14.5	7.2	9.9	39.0
			Artibeus jamaicensis triomylus				
Average (5♂, 5♀)	55.6	27.1	17.0	14.2[9]	6.8	9.6	38.1
Minimum	54.4	26.2	16.5	13.8	6.7	9.4	27.0
Maximum	57.7	27.9	17.4	14.5	6.9	9.9	45.3
			Artibeus lituratus palmarum				
Average (5♂, 5♀)	65.2	28.9	18.3	15.9	6.5	10.2	56.6
Minimum	63.0	28.3	17.8	15.5	6.2	10.0	43.5
Maximum	68.0	29.5	18.9	16.5	6.8	10.4	69.0
			Artibeus phaeotis nanus				
Average (5♂, 5♀)	36.9	18.6	11.6	10.0	4.6	5.9	10.1[6]
Minimum	35.5	17.7	11.2	9.4	4.2	5.7	8.1
Maximum	38.5	19.0	11.8	10.2	4.8	6.1	11.5
			Artibeus toltecus hesperus				
Average (5♂, 5♀)	39.6	20.2	12.1	10.7	5.0	6.6	14.8
Minimum	38.6	19.7	11.9	10.6	4.7	6.4	12.4
Maximum	41.0	20.5	12.4	11.0	5.2	7.0	16.7

elevations (3200 to 6100 feet) in the southern part of the state. In the vicinity of Santa Lucía, *A. aztecus* has been taken with four other species of the genus (*hirsutus, jamaicensis, lituratus,* and *toltecus*). Jones (1964:512) published measurements of a series of *aztecus* from that locality (Table 3).

Seventeen of 23 females, collected near Santa Lucía in the period 14 to 28 July 1963, were pregnant; embryos ranged from 19 to 29 mm in crown-rump length. Additionally, a pregnant female (embryo 26 mm) was taken southwest of Palmito on 17 July of the same year. Our specimens were netted in orchards or captured in mines by native collectors.

Artibeus hirsutus Andersen, 1906

Specimens examined (22).—3 mi NE El Fuerte, 200 ft, 1; El Fuerte, 3; 2 mi N San Blas, 50 ft, 1; 6 km SW San Blas, 30 ft, 10; 1 mi N Zaragoza, 30 ft, 1; 6 km E Cosalá, 1500 ft, 1; Santa Lucía, 3600 ft, 4; Pánuco, 2050 ft, 1.

Additional record.—Sinaloa de Leyva (Villa-R., 1967:305).

This medium-sized member of the genus occurs the length of Sinaloa in lowland areas; the highest recorded elevation of occurrence in the state is 3600 feet. Most of our specimens were captured in mist nets over ponds or streams, or in mango groves. One from 1 mi N Zaragoza was taken from a small cave in a rocky hillside where another individual and many *Balantiopteryx plicata* were observed. A specimen from 3 mi NE El Fuerte was shot as it sought food in a strangler fig. *Artibeus hirsutus* is the only one of the six species of the genus occurring in Sinaloa that does not reach its northern distributional limits in the state.

Four of seven females collected on 6 August were pregnant (embryos 22-30 mm in crown-rump length); a fifth aborted a term fetus (forearm 17.8 mm), whereas one taken on 7 June was lactating. Two other females (taken in July and December) were not reproductively active. Two males taken in December and one in July each had testes 5 mm in length.

Artibeus jamaicensis triomylus Handley, 1966

Specimens examined (71).—10 km S, 38 km E Sinaloa, 800 ft, 5; 12 mi NE San Benito, 1000 ft, 11; San Benito, 400 ft, 5; 20 km N, 5 km E Badiraguato, 1800 ft, 14; 1.5 km N Badiraguato, 750 ft, 1; 7 mi ENE Presa Sanalona, 600 ft, 3; 2 mi E Aguacaliente, 800 ft, 1; 32 mi SSE Culiacán, 1; 1 mi S El Dorado, 1; 6 km E Cosalá, 1500 ft, 6; La Cruz, 30 ft, 1; San Ignacio, 700 ft, 5; 0.5 mi E Piaxtla, 2; 1 km NE Santa Lucía, 3700 ft, 3; Santa Lucía, 3600 ft, 1; 1 mi E Santa Lucía, 3650 ft, 1; 8 km N Villa Unión, 450 ft, 5; Plomosas, 2500 ft, 1; 5 mi WSW Plomosas, 800 ft, 3; S end, Isla Palmito del Verde, 1.

Additional records.—Sinaloa de Leyva (Villa-R., 1967:296); Río Piaxtla (on Mexican Highway 15 at Camino Real) (Baker, 1967:427).

The Jamaican fruit-eating bat is one of the commonest chiropterans in areas of Sinaloa where fruits are available throughout the year. Most of our specimens were netted over streams lined with fruit trees or in orchards. At a village known locally as Cahuinahuato (between Tule and Mocorito at a place 10 km S, 38 km E Sinaloa), individuals of this species were seen emerging from a hollow limb of a fig tree. They foraged higher in the tree, some returning in approximately 10 minutes with cut green figs to the hollow.

Pregnant females were collected in January, February, and April through July, and those in lactation were caught in Septem-

ber and November. Five males had the following testicular lengths in the months listed: April (7 mm), July (5, 8, 8 mm), October (6 mm).

Handley (1966:299) indicated that 96.5 per cent of the specimens of *A. j. triomylus* he examined from western México had the M3 present in both maxillae. We found this tooth lacking (on both sides) in only one of 30 skulls examined from Sinaloa.

Artibeus lituratus palmarum J. A. Allen and Chapman, 1897

Specimens examined (101).—12 mi NE San Benito, 1000 ft, 1; 20 km N, 5 km E Badiraguato, 1800 ft, 10; 12 mi NE Presa Sanalona, 600 ft, 3; 7 mi ENE Presa Sanalona, 600 ft, 2; El Dorado, 12; 1 mi S El Dorado, 10; Cosalá, 1300 ft, 3; 6 km E Cosalá, 1500 ft, 4; San Juan, 8 mi SE San Ignacio, 1; 1 km NE Santa Lucía, 3700 ft, 3; Santa Lucía, 3600 ft, 7; 2.5 km E Santa Lucía, 3200 ft, 5; 5 km SW Santa Lucía, 2150 ft, 2; Pánuco, 2050 ft, 21; 1 km S Pánuco, 2600 ft, 9; 1.5 km W Copala, 1400 ft, 1; 3 mi SE Plomosas, 4000 ft, 3; 5 mi WSW Plomosas, 800 ft, 2; 6 mi NW Teacapán, 1; S end, Isla Palmito del Verde, 1.

Additional record.—Río Piaxtla (on Mexican Highway 15 at Camino Real) (Baker, 1967:427).

Artibeus lituratus apparently reaches the northern limit of its range in northern Sinaloa. Like most other frugivorous bats, this species is restricted in distribution to areas in which palatable fruits are available throughout the year. Most of our specimens were netted in orchards or over streams lined with fruit-bearing trees.

Females carrying embryos were collected in February, April, June, and July, and females in lactation were caught in July and October. Thus, reproductive activity in Sinaloan representatives of this species seemingly parallels closely that of the related *A. jamaicensis*. Testes of six males taken in November had an average length of 6.1 (4-7.5) mm; those of two collected in June measured 5 and 7 mm, whereas single males from January, July, and October had testes 4, 6, and 7 mm long, respectively.

Artibeus phaeotis nanus Andersen, 1906

Specimens examined (17).—San Ignacio, 700 ft, 1; La Cruz, 30 ft, 7; Pánuco, 2050 ft, 1; 8 km N Villa Unión, 450 ft, 5; 5 mi WSW Plomosas, 800 ft, 3.

Additional records.—Río Piaxtla (on Mexican Highway 15 at Camino Real) (Baker, 1967:428); Puerta de las Canoas, 11 mi N, 2.5 mi E Mazatlán (Davis, 1970:400); 5 mi SE Copala, 750 ft (Baker and Greer, 1962:70); Presidio (Andersen, 1908:310); Cacalotán (Koopman, 1961:536).

This small fruit-eating bat inhabits the lowlands of southern Sinaloa, the northernmost records being from just south of the 24th parallel at La Cruz, San Ignacio, and Camino Real. All of our specimens were trapped in mist nets over streams or among fruit trees.

Of five females in our series, four taken at La Cruz on 6 July 1962 were pregnant (embryos 21-28 mm in crown-rump length), whereas one obtained on 15 October 1963 evinced no gross reproductive activity. A July-taken male had testes that measured 3 mm, and those of two collected in October measured 5.5 and 6 mm.

Artibeus toltecus hesperus Davis, 1969

Specimens examined (45).—12 mi NE San Benito, 1000 ft, 4; 20 km N, 5 km E Badiraguato, 1800 ft, 18; 7 mi ENE Presa Sanalona, 600 ft, 2; San Ignacio, 700 ft, 1; San Juan, 8 mi SE San Ignacio, 2; Santa Lucía, 3600 ft, 1; Pánuco, 2050 ft, 3; 8 km N Villa Unión, 450 ft, 6; 3 mi SE Plomosas, 4000 ft, 6; 5 mi WSW Plomosas, 800 ft, 2.

Additional records.—Escuinapa (J. A. Allen, 1906:237—see Koopman, 1961:536); 2 mi NW Palmito (Davis, 1969:26—we do not know to which of the several Palmitos in Sinaloa this name refers).

Artibeus toltecus is a common inhabitant of lowlands in the southern half of Sinaloa and occurs northward along the base of the Sierra Madre Occidental at least as far as the vicinity of San Benito, the northernmost locality of record for the species. Altitudinally, *A. toltecus* is most widely distributed below 1000 feet, but has been taken in protected situations along water courses as high as 3600 feet at Santa Lucía and to 4000 feet southeast of Plomosas. All of our specimens were captured in mist nets, most often over water courses near wild fig trees, or in fruit groves.

We have taken pregnant females in January, May, and October, and lactating females in May. Two males collected on 23 October 1963 each had testes measuring 4 mm in length. Jones (1964:512) and Davis (1969:25) published measurements of Sinaloan specimens (Table 3).

Chiroderma salvini scopaeum Handley, 1966

Specimens examined (14).—20 km N, 5 km E Badiraguato, 1800 ft, 1; 1.5 mi N Badiraguato, 750 ft, 1; Santa Lucía, 3600 ft, 8; 1 mi E Santa Lucía, 3650 ft, 1; 8 km N Villa Unión, 450 ft, 1; 5 mi WSW Plomosas, 800 ft, 2.

All of the white-lined bats collected thus far in Sinaloa have been netted under deciduous canopies, frequently over water, and often in the vicinity of trees bearing ripe fruit. For instance, a net placed under a fig tree replete with ripe fruits on 26 January 1964, at a place 20 km N and 5 km E Badiraguato, yielded 51 bats of three genera (*Artibeus*, *Chiroderma*, and *Sturnira*) by 9:30 PM.

A female obtained on 22 January contained one embryo that measured 4 mm in crown-rump length. Males taken in January, July, and October each had testes measuring 5 mm in length. Flying young were netted in early May and late July.

Centurio senex senex Gray, 1842

Specimens examined (4).—12 mi NE San Benito, 1000 ft, 2; 5 mi WSW Plomosas, 800 ft, 2.

An adult male and female netted over a fig-lined stream at a place 12 mi NE San Benito on 22 November 1964 provide the northernmost locality for the wrinkle-faced bat in western México. Two males (one immature, with one deciduous upper incisor still in place) were netted 5 mi WSW Plomosas on 4 May 1964 in an arroyo flanked by oak-covered hills.

Selected measurements of a male and female from 12 mi NE San Benito, followed by those of an adult male from 5 mi WSW Plomosas, are, respectively: total length, 59, 59, 61; length of hind foot, 13, 13.5, 15; length of ear, 16, 15, 15; length of forearm, 42.6, 41.2, 42.5; weight, 24.1, 16.4, 23.5; greatest length of skull, 18.9, 19.0, 18.7; condylobasal length, 14.5, 14.8, 14.4; zygomatic breadth, 14.6, 14.5, 14.5; length of maxillary toothrow, 4.6, 5.1, 5.0; breadth across upper molars, 10.2, 10.5, 10.6.

Desmodus rotundus murinus Wagner, 1840

Specimens examined (54).—16 km NNE Choix, 1700 ft, 7; 20 km N, 5 km E Badiraguato, 1800 ft, 1; 6 km E Cosalá, 1500 ft, 1; 8 km SE Elota, 250 ft, 3; 3 mi SE Camino Real, 500 ft, 8; 1 km NE Santa Lucía, 3700 ft, 1; Santa Lucía, 3600 ft, 1; 1.5 km W Copala, 1400 ft, 4; 7.3 km SW Copala, 1400 ft, 5; 5 mi NW Mazatlán, 2; 8 km N Villa Unión, 450 ft, 8; Matatán, 550 ft, 1; Plomosas, 2500 ft, 8; 5 mi WSW Plomosas, 800 ft, 1; Teacapán, Isla Palmito del Verde, 3.

Additional records.—12 km NE Chinobampo (Villa-R., 1953:429); [Cueva de] la Chinacatera, Monte Largo, 23 km E Pericos (Villa-R., 1959:377); Elota (Villa-R., 1953:429).

Sinaloan specimens of the vampire bat were removed from crevices in caves and mines or were netted over water. In March of 1961, for example, eight individuals were taken from an estimated 35 or so roosting at the end of an abandoned tunnel of a gold mine near Camino Real; other bats inhabiting the tunnel included an estimated 600 *Glossophaga soricina*, 150 *Pteronotus parnellii*, and one *Macrotus waterhousii*.

Pregnant females were obtained only during the dry season. An individual carrying an embryo that measured 12 mm in crown-rump length was obtained in December, a female caught in January contained an embryo 15 mm long, one taken in March bore an embryo that measured 16 mm, and a female obtained in May carried a near-term fetus that measured 29 mm.

Family Natalidae

Natalus stramineus mexicanus Miller, 1902

Specimens examined (132).—1 mi SE El Cajón, 1800 ft, 4; Santa Lucía, 3600 ft, 9; Pánuco, 2050 ft, 55; 1.5 km W Copala, 1400 ft, 1; Copala, 8;

5 mi NW Mazatlán, 26; Matatán, 550 ft, 6; Plomosas, 2500 ft, 17; 0.5 mi W Rosario, 100 ft, 6.

Additional records.—Rosario (Koopman, 1961:536); Escuinapa (J. A. Allen, 1906:236).

Most of the specimens of *Natalus stramineus* in our collections were taken in abandoned mines. At a place 5 mi NW Mazatlán, for example, specimens were obtained from a horizontal tunnel in a rocky cliff facing the sea; funnel-eared bats were concentrated in the darkest part of the tunnel along with scattered clusters of *Desmodus rotundus*, whereas *Balantiopteryx plicata* was abundant near the entrance and several *Glossophaga soricina* were taken elsewhere in the mine. Bats from Pánuco were collected in an old gold-silver mine in which the atmosphere was notably hot and humid. Other species taken in the same mine, in approximate decreasing order of abundance, included *Pteronotus parnellii*, *Mormoops megalophylla*, *Glossophaga soricina*, and *Macrotus waterhousii*.

Koopman (1961:536-537) considered funnel-eared bats from southern Sinaloa to be intergrades between the subspecies *N. s. mexicanus* to the north and *N. s. saturatus* to the south (see also Goodwin, 1959:6-7). On the basis of characters listed by Goodwin (*loc. cit.*), we tentatively refer all our Sinaloan specimens to the subspecies *mexicanus*, realizing, however, the need for a thorough study of infraspecific variation in this species. Several authors have reported different color phases in *N. stramineus*, but our Sinaloan series suggests that such differences are due, in part at least, to "foxing" of the pelage and subsequent (annual) molt. Fresh adult pelage is pale tawny in color, replacing worn yellowish to orangish hairs dorsally, beginning over the shoulders and spreading both anteriorly and posteriorly.

A female taken on 26 June 1962 contained an embryo that measured 15 mm in crown-rump length. One obtained on 15 July 1963 was lactating.

Family Vespertilionidae

Myotis californicus mexicanus (Saussure, 1860)

Specimens examined (3).—5 mi E Plomosas, 5500 ft, 2; 3 mi SE Plomosas, 4000 ft, 1.

Sinaloan specimens of this species were netted or shot in pine-oak forest. A female, taken on 30 April 1965, contained an embryo measuring 10 mm in crown-rump length. Measurements and weights of this and other species of *Myotis* that occur in the state were recorded by Jones *et al.* (1971).

Myotis fortidens fortidens Miller and Allen, 1928

Specimens examined (7).—Cosalá, 1300 ft, 1; 6 km E Cosalá, 1500 ft, 3; Isla Palmito de la Virgen, 15 ft, 3.

Additional record.—Escuinapa (Hall and Dalquest, 1950:583).

At Cosalá specimens were taken in mist nets over streams, whereas those from the barrier island of Palmito de la Virgen were caught, along with *Noctilio leporinus* and *Rhogeessa parvula*, in nets over a freshwater pond. Four of five females taken in June were pregnant, containing embryos measuring 4, 7, 10, and 12 mm in crown-rump length.

Myotis fortidens sonoriensis Findley and Jones, 1967

Our collections contain a single specimen of this large, relatively dark race of *fortidens*—from the Río del Fuerte, 1 mi N and 0.5 mi E San Miguel. Measurements of this specimen and of those of the preceding subspecies were recorded by Jones *et al.* (1971).

Myotis velifer velifer (J. A. Allen, 1890)

Specimens examined (84).—0.5 mi SE Vaca, 650 ft, 1; El Fuerte, 150 m, 2; Río del Fuerte, 1 mi N, 0.5 mi E San Miguel, 1; 10 mi NNW Los Mochis, 1; La Cruz, 30 ft, 1; 1 km NE Santa Lucía, 3700 ft, 16; Santa Lucía, 3600 ft, 4; 1 mi E Santa Lucía, 3650 ft, 52; 1 km NE Pánuco, 2700 ft, 1; 7 mi ENE Plomosas, 6000 ft, 2; 3 mi SE Plomosas, 4000 ft, 3.

Additional record.—Monte Largo, *ca.* 14 mi W Pericos (Constantine, 1959:442).

The cave myotis is the most abundant and widely distributed vespertilionid in Sinaloa, where it occurs from coastal areas to at least 6000 feet in elevation and probably higher. Most of our specimens were captured in mist nets or shot in flight as they foraged. External and cranial measurements of a series from the vicinity of Santa Lucía were given by Jones *et al.* (1971).

Nineteen of 27 June-taken females from Sinaloa were pregnant and five were lactating; we took lactating females as late as 23 July, when flying young of the year also were caught. Thirteen embryos from females taken in the vicinity of Santa Lucía in late June varied from 14 to 30 mm (average 20.2) in crown-rump length.

Myotis yumanensis lutosus Miller and Allen, 1928

Specimens examined (6).—0.5 mi SE Vaca, 650 ft, 3; 6 km NE El Fuerte, 150 m, 1; 2 mi E Aguacaliente, 800 ft, 1; Cosalá, 1300 ft, 1.

Sinaloan specimens of the Yuma myotis were netted or shot over streams bordered with deciduous trees. In the vicinity of Vaca, the deciduous vegetation was replaced abruptly by thorn forest away from the tributaries of the Río del Fuerte. A female

from Cosalá netted on 15 June 1962 carried an embryo that measured 14 mm in crown-rump length.

Jones *et al.* (1971) commented on the taxonomic status of bats of this species in western México and listed measurements of Sinaloan specimens.

Pipistrellus hesperus hesperus (H. Allen, 1864)

Specimens examined (5).—6 km NE El Fuerte, 150 m, 1; 10 mi NNW Los Mochis, 3; 1 mi E Santa Lucía, 3650 ft, 1.

Additional record.—73 mi S Navajoa, Sonora (and 2 mi W Mexican Highway 15) (Findley and Traut, 1970:760).

Reasons for use of the subspecific name *P. h. hesperus* instead of *P. h. australis* for pipistrelles from western México were given by Findley and Traut (1970). Specimens labeled from El Fuerte and Los Mochis were shot as they flew among trees along the Río del Fuerte; most of the land beyond the deciduous border of the river was fenced and cultivated. The bat from 1 mi E Santa Lucía was netted over a small stream.

Neither of two females taken in June from near Los Mochis was reproductively active, but a female (in alcohol) obtained northwest of El Fuerte on 13 June had enlarged mammae and presumably was lactating.

Eptesicus fuscus miradorensis (H. Allen, 1866)

Specimens examined (2).—7 mi ENE Plomosas, 6000 ft, 1; 3 mi SE Plomosas, 4000 ft, 1.

Additional records.—30 mi SW El Salto [Durango], 2160 m (Villa-R., 1967:402); 2 km W Palmito [Palmarito], 6000 ft (Irwin and Baker, 1967: 195); 1 km W Palmito [Palmarito] (Baker and Patton, 1967:285).

Subspecific identity of big brown bats from Sinaloa and the remainder of western México is uncertain, and assignment here of Sinaloan specimens to *E. f. miradorensis* is tentative pending study of geographic variation throughout the range of the species. Specimens from Sinaloa are not notably different with respect to size or color than specimens at hand from Jalisco, Zacatecas, Guerrero, and Sonora, but are slightly paler than specimens from eastern México—Nuevo León, Puebla, and Veracruz (near the type locality of *miradorensis*). On the other hand, specimens from western México that we have examined are conspicuously darker than typical Great Plains and Great Basin representatives of *E. f. pallidus*, a subspecific name that frequently has been applied to populations of *E. fuscus* in northwestern México.

One of our two specimens, both males, was shot as it foraged in pine-oak woods; the other was netted over a small, mountain

stream in the pine-oak zone. All records of this bat from Sinaloa are from the mountainous eastern part of the state.

Lasiurus borealis teliotis (H. Allen, 1891)

Specimens examined (5).—10 mi NNW Los Mochis, 1; 5 mi WSW Plomosas, 800 ft, 2; 3 mi SE Plomosas, 4000 ft, 1; Tatemales (near Rosario), 1 (BM).

Additional record.—2 km W Palmito [Palmarito], 6000 ft (Irwin and Baker, 1967:195).

The red bat apparently is relatively uncommon in Sinaloa. The earliest date on which a specimen has been taken in the state is 1 February; other specimens of which we have record, all nonreproductive females (weights of three, 8.0, 7.7, and 6.9 gms), were obtained on 26 April, 4 and 5 May, and 1 and 8 June. It is not known whether red bats are migratory in western México.

Lasiurus cinereus cinereus (Palisot de Beauvois, 1796)

A male netted 2 km W Palmito [Palmarito] at an elevation of 6000 feet, on 1 February 1966 (Irwin and Baker, 1967:195; Baker and Patton, 1967:285), is the only hoary bat thus far reported from the state. The season of capture suggests that this species may be a winter resident in mountainous eastern Sinaloa. Possibly, too, some migrants pass through that part of the state in autumn and again in late winter or early spring.

Lasiurus ega xanthinus (Thomas, 1897)

Specimens examined (3).—0.5 mi SE Vaca, 650 ft, 1; 1 mi S Pericos, 1; Mazatlán, 1.

Additional record.—Escuinapa (Handley, 1960:475).

This yellow bat apparently is an uncommon resident of Sinaloa. A male from 0.5 mi SE Vaca was netted over a pool in the Río del Fuerte. No precise data are available on the circumstances of capture of our other two specimens, one an adult female and the other an immature male (13 July).

Lasiurus intermedius intermedius H. Allen, 1862

A female, shot on 30 June 1962 from a coco palm 3 mi N Mazatlán (Loomis and Jones, 1964:32), is the only northern yellow bat known from Sinaloa and the northernmost record for the species in western México. This bat carried two embryos, each 25 mm in crown-rump length.

Rhogeessa parvula parvula H. Allen, 1866

Specimens examined (33).—16 km NNE Choix, 1700 ft, 3; 1 mi S El Cajón, 1800 ft, 1; 6 km NE El Fuerte, 150 m, 6; 1 mi E Sinaloa, 180 ft, 1; 1 mi S, 6 mi E El Carrizo, 1; 7 mi ESE Presa Sanalona, 600 ft, 1; La Cruz, 30 ft, 3; 0.5 mi E Piaxtla, 6; 12 km N Villa Unión, 400 ft, 1; 5 mi

WSW Plomosas, 800 ft, 5; Isla Palmito de la Virgen, 15 ft, 1; 2 mi E Palmito, 10 ft, Isla Palmito del Verde, 4.

Additional record.—El Molino (Koopman, 1961:537).

Most of the specimens of this small bat in our collection were netted over ponds or streams. The species occurs the entire length of the state at low and moderate (up to 1800 feet) elevations, and reaches the northernmost limits of its range in western México in adjacent southern Sonora.

Four females taken in May each contained two embryos (6, 10, 10, and 10 mm in crown-rump length). Two of seven females caught in June were gravid (twins, 10 and 13 mm in crown-rump length), whereas the remainder had enlarged mammae indicating past or present lactation; a female taken in July also had enlarged mammae. A male obtained on 30 October had testes 6 mm in length.

Goodwin (1958) reviewed the taxonomy of the genus and listed selected measurements for specimens of *R. p. parvula* from Sonora and Nayarit. Two Sinaloan males and a nonpregnant female weighed 3.3, 3.2, and 3.1 gms, respectively, whereas one of the pregnant females taken in May weighed 4.7 gms.

Family Molossidae

Tadarida brasiliensis mexicana (Saussure, 1860)

Specimens examined (59).—0.5 mi SE Vaca, 650 ft, 3; El Fuerte, 150 m, 47; 1 mi S, 6 mi E El Carrizo, 1; 13 mi ESE Badiraguato, 800 ft, 5; Pericos, 1; Mazatlán, 10 ft, 2.

Additional records.—Bacubirito (Villa-R., 1967:442); 3 km N, 8 km W Topolobampo, 10 m (Davis and Loomis, 1971:453); Monte Largo, *ca.* 14 mi W Pericos (Constantine, 1959:442); Navolato (Villa-R. and Cockrum, 1962:54); Culiacán (Shamel, 1931:24); 2 km W Palmito [Palmarito], 6000 ft (Irwin and Baker, 1967:195); Esquinapa (J. A. Allen, 1906:236).

Aside from a series taken in June from El Fuerte and a female from Pericos that was obtained on 14 June 1954, free-tailed bats of this species were taken in Sinaloa only in the cold months (November through February). Specimens were obtained at El Fuerte in December and on 14-15 June. At the latter time, two males and 26 females (25 of which were pregnant, with crown-rump lengths of embryos ranging from 16 to 32 mm) were removed from the attic of an old building. The large size of embryos suggests that this concentration may have represented an incipient maternity colony. No other such colonies have been reported from Sinaloa, however, and Cockrum (1969:310) reported that most pregnant females arrive at maternity roosts in Arizona a few days prior to parturition.

A large number of crania of *T. b. mexicana* was found in owl pellets taken from a cave 1.5 mi NW Topolobampo. Remains of several *T. femorosacca* and one *Macrotis waterhousii* also were found in these pellets, along with those of numerous rodents.

Tadarida femorosacca (Merriam, 1889)

Specimens examined (15).—1.5 mi NW Topolobampo, 10 ft, 6; Rosario, 500 ft, 9.

Additional records.—3 km N, 8 km W Topolobampo, 10 m (Davis and Loomis, 1971:453); 4.3 km NW Topolobampo (Loomis and Webb, 1969:41).

Six specimens from northwest of Topolobampo, all adult males, were shot on 18 December 1961 by P. L. Clifton and J. H. Bodley in a cave some 50 yards inland from the coastline of the Pacific Ocean. The cave was approximately 50 feet wide, 25 feet deep, and 15 feet high; it was open and light, with the bats clustered in narrow crevices in the ceiling. One other species (*Balantiopteryx plicata*) was taken in the cave, and droppings of fruit-eating bats were found on the floor and around the entrance. Clifton also found remains of *T. femorosacca* (see previous account) in owl pellets collected there. The specimens listed by Loomis and Webb (1969:41) may have been obtained in this same cave. The bats from Rosario (six adult males and three adult females) were taken in a church by natives on 22 June 1962. One of three females was pregnant (crown-rump length of single embryo, 18 mm).

Three species of the *Tadarida laticaudata* group—*T. aurispinosa*, *T. femorosacca*, and *T. macrotis*—are known from western México. The two species listed last are on record from Sinaloa, and *aurispinosa* undoubtedly occurs there because specimens are on record both from southern Sonora and from Nayarit. Of the three, *macrotis* is the largest, *aurispinosa* is intermediate in size, and *femorosacca* is the smallest. In addition to the characters mentioned by Gardner (1963:43), *femorosacca* differs from *aurispinosa* in being smaller externally and cranially, in having smaller teeth, and in having a noticeably less inflated braincase (both dorsally and laterally) and rostral area. Also, all specimens of *femorosacca* examined by us are grayish brown dorsally, whereas those of *aurispinosa* are a rich, dark brown; both species have white-based hairs. Cranial measurements of Sinaloan specimens of *femorosacca* and *macrotis* are given in table 4. Cranial measurements for *aurispinosa* were presented by Gardner (1963:42).

Average and extreme external dimensions of six males from 1.5 mi NW Topolobampo, those for five males from Rosario, and measurements of a single female from Rosario are, respectively, as follows: total length, 105.5 (103-109), 103.8 (100-110), 108 mm;

TABLE 4.—Selected cranial measurements of *Tadarida femorosacca* and *Tadarida macrotis* from Sinaloa.

Number averaged or catalogue number, and sex	Greatest length of skull	Zygomatic breadth	Postorbital constriction	Breadth of braincase	Mastoid breadth	Length of maxillary toothrow
Tadarida macrotis, vicinity Plomosas						
KU 97087, ♂	23.9	12.7	4.2	9.8	11.7	9.2
KU 97090, ♂	23.8	12.6	4.1	10.0	11.5	9.1
KU 97091, ♂	24.3	12.7	4.0	10.4	11.7	9.0
Tadarida femorosacca 1.5 mi NW Topolobampo						
Average (4♂)	19.5	10.6	3.6	9.0	10.3	7.4
Minimum	19.3	10.5	3.4	8.8	10.2	7.3
Maximum	19.8	10.8	3.7	9.3	10.5	7.5
Rosario						
Average (5♂)	19.6	10.6	3.6	9.1	10.3	7.4
Minimum	19.3	10.4	3.5	8.9	10.1	7.3
Maximum	19.8	10.9	3.7	9.3	10.4	7.5
KU 90762, ♀	19.2	10.3	3.4	8.8	10.3	7.3

length of tail, 37.8 (34-42), 40.4 (37-44), 41 mm; length of hind foot, 11.2 (11-12), 10.8 (10-11), 11 mm; length of ear, 23.0 (22-24), 23.8 (23-24), 23 mm; length of forearm, 46.8 (45.6-47.8), 47.1 (46.3-47.7), 48.7 mm; weight, 15.2 (13.0-18.0), 12.0 (11.5-13.5), 14.5 gms.

Tadarida macrotis (Gray, 1839)

Specimens examined (5).—3 mi SE Plomosas, 4000 ft, 1; 5 mi WSW Plomosas, 800 ft, 4.

Specimens listed herein, all taken in early May of 1964, provide the first records for the big free-tailed bat in Sinaloa. At the first locality listed, a male was netted over a mountain stream in pine-oak forest. Specimens from the second locality, two males and two nonpregnant females, were netted in an arroyo. It seems likely that this species will be found elsewhere in the state at moderate elevations in areas along the western edge of the Sierra Madre Occidental.

External measurements of three adult males are: total length, 150, 124, 137 mm; length of tail, 59, 45, 52 mm; length of hind foot, 13, 12.5, 13 mm; length of ear, 33, 31, 33 mm; length of forearm, 61.8, 60.8, 62.2 mm; weight, 22.7, 20.2, 22.5 gms. Cranial measurements are given in the same order in table 4. The forearms of two females preserved in spirits measured 60.6 and 63.2 mm.

Eumops perotis californicus (Merriam, 1890)

A male, taken by Robert J. Baker and associates of Texas Tech University in a mist net at kilometer marker 1665 on Mexican Highway 15, a few miles south of the Sonoran border, provides the only record of the greater mastiff bat from Sinaloa. The series of nets in which this bat was captured were stretched across a pond that provided the water supply for local residents; *Pteronotus parnellii, Rhogeessa parvula,* and *Tadarida brasiliensis* were collected at the same place.

Molossus ater nigricans Miller, 1902

Specimens examined (30).—1 mi S Pericos, 2; 32 mi SSE Culiacán, 9; La Cruz, 30 ft, 2; 1 mi SE Camino Real, 400 ft, 7; 0.5 mi E Piaxtla, 1; Rosario, 1 (BM); Tatemales (near Rosario), 5 (BM); Palmito, Isla Palmito de la Virgen, 20 ft, 3.

This bat is widely distributed in lowlands of western Sinaloa, north at least to the vicinity of Pericos. As indicated by Jones *et al.* (1962:155), specimens listed from Camino Real and Piaxtla were obtained along the Río Piaxtla at approximately the same place.

A female from 32 mi SSE Culiacán, taken on 18 June, contained an embryo 18 mm in crown-rump length, whereas two obtained at La Cruz on 4 July carried embryos measuring 7 and 13 mm. Females collected on 1 March near Camino Real evidenced no reproductive activity; two males from this same place and date had testes 7 and 8 mm in length.

Molossus molossus aztecus Saussure, 1860

An individual reported by Gardner (1966:5) from Alisos is the only specimen of this small mastiff bat thus far reported from Sinaloa.

Molossus sinaloae sinaloae J. A. Allen, 1906

The holotype and paratype of *M. s. sinaloae,* from Escuinapa, remain the only specimens of this bat known from the state.

DISTRIBUTIONAL SUMMARY

Among the 44 chiropteran species presently recorded from Sinaloa, there is one representative each of the families Emballonuridae and Noctilionidae, four chilionycterids, 19 phyllostomatids, a single natalid, 11 species of Vespertilionidae and seven of Molossidae. The majority of species are closely associated with the Neotropics—tropical or subtropical in their affinities—and distributed at low or middle altitudes in Sinaloa.

The emballonurid, noctilionid, and four chilonycterids all are Neotropical taxa, but only one (*Noctilio leporinus*) reaches its northernmost distribution in Sinaloa; all of the others occur northward in western México at least as far as adjacent southern Sonora.

The 19 species of Phyllostomatidae, all with Neotropical affinities, are about evenly divided between those that reach northern distributional limits in Sinaloa (11 species) and those that occur also to the north of the state. Species that are found no farther north than Sinaloa include the glossophagines *Glossophaga commissarisi, Anoura geoffroyi, Choeroniscus godmani,* and *Leptonycteris nivalis* (occurs northward to Texas east of the Sierra Madre Occidental), and the stenodermine taxa *Sturnira ludovici, Artibeus aztecus, A. lituratus, A. phaeotis, A. toltecus, Chiroderma salvini* (recorded also from southwestern Chihuahua), and *Centurio senex.* The one species of Natalidae, *Natalus stramineus,* is widespread in the Neotropics, reaching distributional limits in western México in Baja California and Sonora.

The 11 kinds of vespertilionids present an interesting array of zoogeographic affinities. Four (*Myotis californicus, M. velifer, M. yumanensis,* and *Pipistrellus hesperus*) are temperate species, four more (*Myotis fortidens, Lasiurus ega, L. intermedius,* and *Rhogeessa parvula*) are Neotropical taxa, whereas the remaining three (*Eptesicus fuscus, Lasiurus borealis,* and *L. cinereus*) are best categorized as "widespread" species, all occurring in temperate and tropical regions and in both North and South America. The four species of *Lasiurus* are especially interesting in that the widespread *borealis* and *cinereus* may occur in Sinaloa only as migrants, wintering to the south and probably occurring far to the north in summer, whereas *ega* and *intermedius* probably migrate only locally and are year-round residents in western México. *Lasiurus intermedius* is the only vespertilionid thought to reach distributional limits in Sinaloa.

New World molossid bats all are basically Neotropical elements, but several, most notably *Tadarida brasiliensis* and *T. macrotis,*

occur far northward into temperate regions as warm-season migrants. In contrast, the three species of *Molossus* known from the state (*ater*, *molossus*, and *sinaloae*) are relatively sedentary and reach their northernmost known distribution in Sinaloa.

In summary, the known chiropteran fauna of Sinaloa is composed of a preponderance of species (37) with Neotropical affinities. The remaining seven taxa recorded from the state, all vespertilionids, include four that are temperate in association and three that are widely distributed and not readily assignable to any major faunal unit. However, of the latter, *Eptesicus fuscus* has a wide distribution in temperate North America, barely reaches South America, and, where it occurs in Central America, generally is found at relatively high altitudes, whereas *Lasiurus cinereus*, a species with a disjunct South American distributional segment, inhabits temperate environs in North America in the warm season and migrates southward to highlands in México and northern Middle America in winter.

Relatively little geographic variation has been detected in bats in Sinaloa. Only three species—*Balantiopteryx plicata*, *Macrotis waterhousii*, and *Myotis fortidens*—are represented in the state by two subspecies; in each case the races are separated on a north-south basis.

RESUMEN

Previamente se ha publicado poco con respecto a la fauna mastozoológica de Sinaloa, México. En esta publicación se resumen los datos sistemáticos y ecológicos de los Chiroptera conocidos de este estado. Cuarenta y cuatro especies están representadas por cinco familias: Emballonuridae (1 especie), Noctilionidae (1), Chilonycteridae (4), Phyllostomatidae (19), Natalidae (1), Vespertilionidae (11), y Molossidae (7).

De esas 44 especies, 37 tienen afinidades Neotropicales, y 16 de estas alcanzan en Sinaloa, su extrema distribución nórdica en el occidente de México. Las siete especies restantes, todas vespertilionidos, se dividen en dos grupos: cuatro con afinidades temperadas, y tres (*Eptesicus fuscus*, *Lasiurus borealis*, *L. cinereus*), con una distribución muy amplia en las Américas.

Entre los murciélagos que se encuentran en Sinaloa, se observó muy poca variación geográfica. Solo tres especies tienen mas de una subespecie con una distribución de norte a sur.

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